

CLAIMS

1. An apparatus, comprising:

at least one first element adapted to change its physical form based at least in part on a
5 predetermined temperature condition; and

at least one second element arranged with respect to the at least one first element such
that at least one change in the physical form of the first element causes the second element to
break.

10 2. The apparatus of claim 1, wherein the at least one first element is configured to change
its physical form upon significant exposure to the predetermined temperature condition.

3. The apparatus of any of the foregoing claims, wherein the apparatus is configured such
that the at least one first element changes its physical form upon significant exposure for a
15 predetermined time period to the predetermined temperature condition.

4. The apparatus of claim 1, wherein the predetermined temperature condition is a
freezing condition.

20 5. The apparatus of claim 4, wherein the freezing condition represents approximately a
freezing temperature of water.

6. The apparatus of claim 1, wherein the predetermined temperature condition is a
thawing condition.

25 7. The apparatus of claim 6, wherein the thawing condition represents approximately a
melting temperature of ice.

8. The apparatus of claim 1, wherein the predetermined temperature condition relates to a
30 significant exposure of the at least one first element to at least one target temperature.

9. The apparatus of claim 8, wherein the predetermined temperature condition relates to a significant exposure of the at least one first element to the at least one target temperature for a predetermined amount of time.

5 10. The apparatus of claim 1, wherein the predetermined temperature condition relates to a significant exposure of the at least one first element to at least one temperature above or below a target temperature range.

10 11. The apparatus of claim 10, wherein the predetermined temperature condition relates to a significant exposure of the at least one first element to at least one temperature above or below the target temperature range for a predetermined amount of time.

12. The apparatus of claim 1, wherein the at least one first element includes at least one bimetallic element.

15 13. The apparatus of claim 12, wherein the at least one bimetallic element includes a bimetallic disk.

20 14. The apparatus of claim 13, wherein the bimetallic disk includes at least one deformation, and wherein the apparatus is configured such that the at least one deformation impacts the at least one second element when the bimetallic disk changes form.

15. The apparatus of claim 1, wherein at least a portion of the at least one second element is formed as a breakable fuse.

25 16. The apparatus of claim 1, wherein at least a portion of the at least one second element is formed as a thermal fuse.

30 17. The apparatus of claim 1, wherein at least a portion of the at least one second element is formed from glass.

18. The apparatus of claim 1, wherein the at least one second element includes at least one colored element.

19. The apparatus of claim 1, wherein the at least one second element includes at least one glass fuse.

5 20. The apparatus of claim 19, wherein the at least one glass fuse includes at least one colored glass fuse.

21. The apparatus of claim 1, wherein the apparatus is configured such that a breakage of the at least one second element provides an irreversible indication to an observer that the at
10 least one first element was exposed to the predetermined temperature condition.

22. The apparatus of claim 1, further including a user-operated arming mechanism having at least an unarmed state and an armed state, wherein the apparatus is configured such that, in the unarmed state, the at least one first element is unable to cause the at least one second
15 element to break notwithstanding changes in the physical form of the at least one first element and, in the armed state, the at least one first element is able to cause the at least one second element to break based on at least one change in the physical form of the at least one first element.

20 23. A temperature event indicator, comprising:

an at least partially transparent housing;

a bimetallic disk disposed in the housing, the bimetallic disk adapted to change its physical form based at least in part on an exposure to a predetermined temperature condition;
and

25 a glass fuse disposed in the housing and arranged with respect to the bimetallic disk such that at least one change in the physical form of the bimetallic disk causes the glass fuse to break, thereby providing an irreversible indication to an observer that the bimetallic disk was exposed to the predetermined temperature condition.

30 24. The indicator of claim 23, wherein the indicator is configured such that the bimetallic disk changes its physical form upon significant exposure for a predetermined time period to the predetermined temperature condition.

25. The indicator of claim 23, wherein the predetermined temperature condition is a freezing condition.

26. The indicator of claim 25, wherein the freezing condition represents approximately a freezing temperature of water.

27. The indicator of claim 23, wherein the predetermined temperature condition is a thawing condition.

28. The indicator of claim 27, wherein the thawing condition represents approximately a melting temperature of ice.

29. The indicator of claim 23, wherein the predetermined temperature condition relates to a significant exposure of the bimetallic disk to at least one target temperature.

30. The indicator of claim 29, wherein the predetermined temperature condition relates to a significant exposure of the bimetallic disk to the at least one target temperature for a predetermined amount of time.

31. The indicator of claim 23, wherein the predetermined temperature condition relates to a significant exposure of the bimetallic disk to at least one temperature above or below a target temperature range.

32. The indicator of claim 31, wherein the predetermined temperature condition relates to a significant exposure of the bimetallic disk to at least one temperature above or below the target temperature range for a predetermined amount of time.

33. The indicator of claim 23, wherein the housing has a substantially round shape having a diameter of less than one inch.

34. The indicator of claim 33, wherein the housing has a thickness of less than one-half an inch.

35. The indicator of claim 34, wherein the thickness of the housing is approximately one-quarter of an inch.

36. The indicator of claim 23, further including a user-operated arming mechanism having at least an unarmed state and an armed state, wherein the indicator is configured such that, in the unarmed state, the bimetallic disk is unable to cause the glass fuse to break notwithstanding changes in the physical form of the bimetallic disk and, in the armed state, the bimetallic disk is able to cause the glass fuse to break based on at least one change in the physical form of the bimetallic disk.

37. A method of indicating a temperature event associated with at least one item, comprising an act of:

a) associating at least one breakable component with the at least one item, the at least one breakable component being configured to break upon an occurrence of the temperature event.

38. The method of claim 37, wherein the at least one item is a perishable item.

39. The method of claim 37, wherein the at least one item is a consumable item.

40. The method of claim 39, wherein the at least one consumable item is for human consumption.

41. The method of claim 37, wherein the at least one item is a food item.

42. The method of claim 37, wherein the at least one item is a beverage.

43. The method of claim 37, wherein the at least one item is a medicine.

44. The method of claim 37, wherein the at least one item is a vaccine.

45. The method of claim 37, wherein the temperature event relates to a freezing of the at least one item.

46. The method of claim 37, wherein the temperature event relates to a thawing of the at least one item.

5 47. The method of claim 37, wherein the temperature event relates to an exposure of the at least one item to at least one target temperature.

48. The method of claim 47, wherein the temperature event relates to an exposure of the at least one item to the at least one target temperature for a predetermined amount of time.

10 49. The method of claim 37, wherein the temperature event relates to an exposure of the at least one item to at least one temperature above or below a target temperature range.

50. The method of claim 49, wherein the temperature event relates to an exposure of the at least one item to at least one temperature above or below the target temperature range for a predetermined amount of time.

51. The method of claim 37, wherein the at least one item includes one item enclosed in an individual package, and wherein the act a) includes an act of:

20 coupling the at least one breakable component to the individual package.

52. The method of claim 37, wherein the at least one item includes one item enclosed in an individual package, and wherein the act a) includes an act of:

25 placing the at least one breakable component inside the individual package together with the one item.

53. The method of claim 37, wherein the at least one item includes at least two items enclosed in a group package, and wherein the act a) includes an act of:

coupling the at least one breakable component to the group package.

30 54. The method of claim 37, wherein the at least one item includes at least two items enclosed in a group package, and wherein the act a) includes an act of:

placing the at least one breakable component inside the group package together with the at least two items.

55. The method of claim 53, wherein the at least two items include at least two same items.

56. The method of claim 53, wherein the at least two items include at least two different items.

57. The method of claim 37, wherein the act a) includes acts of:

enclosing the at least one breakable element in an at least partially transparent housing;
and
thermally associating the at least partially transparent housing with the at least one item.

58. The method of claim 37, wherein the at least one breakable element includes at least one fuse.

59. The method of claim 58, wherein the at least one fuse includes a thermal fuse.

60. The method of claim 58, wherein the at least one fuse includes a glass fuse.

61. The method of claim 58, wherein the at least one fuse is arranged with respect to at least one deformable element adapted to change its physical form based at least in part on the temperature event.

62. The method of claim 61, wherein the at least one deformable element includes at least one bimetallic disk.

63. The method of claim 61, further comprising an act of:

b) causing the at least one fuse to break upon an occurrence of the temperature event.

64. The method of claim 63, wherein the act b) includes an act of:

deforming the at least one deformable element upon the occurrence of the temperature event so as to break the at least one fuse.

65. A method for indicating if a vaccine has been frozen, comprising an act of:

5 a) associating at least one breakable component with the vaccine, the at least one breakable component configured to break upon an occurrence of a freezing condition of the vaccine.

66. The method of claim 65, wherein the vaccine is disposed in a protective container, and
10 wherein the act a) includes an act of:

a1) thermally associating the at least one breakable component with the protective container.

67. The method of claim 66, wherein the act a1) includes acts of:

15 enclosing the at least one breakable element in an at least partially transparent housing;
and
thermally coupling the at least partially transparent housing with the vaccine.

68. The method of claim 67, wherein the vaccine is disposed in multiple vials contained in
20 a package, and wherein the act a1) further includes an act of:

placing the at least partially transparent housing enclosing the at least one breakable element inside the package together with the multiple vials of vaccine.

69. The method of claim 67, wherein the at least one breakable element includes at least
25 one fuse.

70. The method of claim 69, wherein the at least one fuse includes a glass fuse.

71. The method of claim 70, wherein the glass fuse is arranged with respect to at least one
30 deformable element also contained in the at least one transparent housing and adapted to change its physical form based at least in part on the freezing condition of the vaccine.

72. The method of claim 71, wherein the at least one deformable element includes at least one bimetallic disk.

73. The method of claim 72, further comprising an act of:

5 b) causing the at least one fuse to break upon an occurrence of the freezing condition.

74. The method of claim 73, wherein the act b) includes an act of:

 deforming the at least one deformable element upon the occurrence of the freezing condition so as to break the at least one fuse.